the end of the tube over which the cap fits, the whole is made perfectly air-tight so that good vacua can be obtained. For taking photographs of bones, &c., none of the other tubes that the author had constructed or purchased approached anywhere near the present one in respect of intensity and sharpness of definition.

In the *Journal of Physiology*, Dr. Lazarus Barlow has pointed out that before the laws of osmosis, deduced from the final osmotic pressure, freezing point, &c., can be applied to the explanation of biological problems, it is necessary to determine whether the initial rates of osmosis of substances bear constant ratios to their final osmotic pressures, and whether the presence of proteid substances in the solutions affects the initial rate of osmosis. The author has found that the initial rates of osmosis cannot be determined from observations of the freezing points of solutions, and that proteid substances, even when present only in minute quantities, markedly diminish the rate of osmosis. In a subsequent paper, Dr. Barlow applies these conclusions to the consideration of lymph-formation, and describes observations of the specific gravity of the blood, of voluntary muscle, and of lymph, which have an important bearing on the question. In his conclusion the author summarises the evidence in favour of the occurrence of osmosis and increased filtration as the effective factors in causing the increased outflow of lymph that is seen after the injection of a crystalloid into the blood, as well as the evidence against the view that osmosis and increased filtration alone account for the observed phenomena.

A valuable little pamphlet on "Coal Mining," full of information on many questions of practical importance in the working and use of coal, has been received from Mr. W. Galloway. The pamphlet is an excerpt from the "Handbook of the Cardiff Exhibition," and may be obtained from the office of the *Western Mail*, Cardiff.

During the spring and summer, Herr P. Sintenis has been carrying out a botanical exploration of the mountains of the Peloponnesus. After visiting Volo in Thessaly, he proposes to investigate the almost unknown flora of the south-western portion of the Pindu Chain.

At the time of his death Mr. Seebohm had almost completed an exhaustive monograph on the "Family of Thrushes" We learn that Dr. Bowdler Sharpe has undertaken to finish the work, and that it will shortly be published by Messrs. Henry Sotheran and Co. It will be illustrated with nearly 150 coloured plates, and the edition will be limited to 250 copies.

A short account of the proceedings of the Sixth International Geographical Congress, held in London last July, appeared in these columns at the close of the Congress. The official Report, containing the addresses delivered and papers read before the Congress, together with a brief historical statement, has now been published. When it is remembered that the papers are in several languages, and that authors are often procrastinators in the matter of reading and returning proofs, the appearance of the Report within a year of the Congress is commendable. Most of the papers are of international interest, and all of them are of geographical value. The two Secretaries of the Congress, and Dr. Mill, who has done the editorial work in connection with the Report, are to be congratulated upon having brought their difficult tasks to a satisfactory conclusion.

The second edition of the valuable "Statistical Atlas of India" has been published by the Government of India, and is obtainable from Mr. Edward Stanford. The Atlas originally appeared in 1886, but since then another census of India has been taken, and new information has been obtained, so that a revision of the maps was necessary. The maps and diagrams in the Atlas give a good general idea of the character, inhabitants, and resources of India, and illustrate the commercial, financial, and educational condition of the country. Explanatory chapters are contributed by persons having special knowledge of the subjects of them; thus, Sir E. C. Buck writes on physical configuration, irrigation, famine, revenue and rent systems; Dr. W. King, on the geology of India; and Mr. J. Eliot, on the rainfall and climate. Mr. George Watt deals with crops and economic minerals; Mr. B. Ribbentrop with forests; Mr. J. E. O'Conor with prices, foreign trade, finance and taxation; and Veterinary-Lieutenant H. T. Pease with horses and live-stock. The Atlas is an excellent piece of work, which conveys by concise text and clear illustration, an abundance of information concerning our great Indian Empire.

The additions to the Zoological Society's Gardens during the past week include a Vervet Monkey (*Cercopithecus lalandii*, ♂) from South Africa, presented by Mr. Vernon E. Barratt; a Black-eared Marmoset (*Hapale penicillata*) from South-east Brazil, presented by Mr. S. Osborn; two Golden Eagles (*Aquila chrysaëtus*), two Peregrine Falcons (*Falco peregrinus*) from the Isle of Mull, presented by the Maclaine of Lochbuie; two Wood Owls (*Syrnium aluco*), a Short-eared Owl (*Asio brachyotus*), British, presented by Mr. A. Farquahar Wilson; a Ring-necked Parrakeet (*Palæornis torquatus*) from India, presented by Miss Smith; a Black-headed Conure (*Conurus nanday*) from Paraguay, presented by Mrs. Baird; two Peafowls (*Pavo cristatus, albino*) from the Transvaal, presented by Mr. F. A. Noyce; a Mona Monkey (*Cercopithecus mona*), two West-African Love-Birds (*Agapornis pullaria*) from West Africa, a Crab-eating Raccoon (*Procyon cancrivorus*) from South America, deposited; an Australian Fruit Bat (*Pteropus poliocephalus*) from Australia, purchased; a Burrhel Wild Sheep (*Ovis burrhel*), a Thar (*Capra jemlaica*), born in the Gardens.

OUR ASTRONOMICAL COLUMN.

Return of Comet Brooks (1889 V.).—A telegram from Kiel announces that Brooks's periodic comet was observed by Javelle at Nice on June 20. At 14h. 17·4m. mean time it was in R.A. 22h. 25m. 30s., Decl. 18° 33′ 59″ S. The comet is now in the southern part of Aquarius, and rises about midnight. It is interesting to note that the observed place of the comet shows a very close agreement with Dr. Bauschinger's search ephemeris printed in Nature (vol. liv. p. 84).

Visibility of Solar Prominences.—Prof. Hale has brought together some facts which emphasise the importance of the work which may be done by observers of solar prominences at the time of a total solar eclipse without going to view the eclipse itself (*Astrophys. Jour.*, May). It is pointed out that in 1870 Tacchini concluded that the dimensions of prominences spectroscopically observed in full sunshine, and measured in Hα light, were considerably smaller than those measured telescopically during an eclipse. In 1883 the same observer discovered the "white prominences," and found that these were not visible in the spectroscope immediately after the eclipse. Similar results were obtained in 1886, and it was further ascertained that the spectrum of a white prominence consisted principally of the H and K lines, the hydrogen lines being extremely feeble.

The results obtained during the eclipse of 1893 furnish valuable data as to the relative efficiency of the different methods of registering the forms of the prominences, as the spectroheliograph at Chicago was employed on that occasion, and a complete set of eye observations was secured by Fenyi at Kalocsa. A comparison is drawn between these non-eclipse observations and the forms of the prominences as photographed nearly at the same time by Prof. Schaeberle, in Chili, and by Mr. Fowler with the prismatic camera in Africa. It turns out that one of

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the largest prominences depicted in all the photographs was not seen at all at Kalocsa. The results with the spectroheliograph were not of the best, owing to haze; but from all available facts, it seems to be established that the white prominences are spectroscopically invisible because they shine chiefly by H and K light. Nevertheless, light of the same refrangibility in the electric arc undoubtedly appears violet; but it may be, as Prof. Hale suggests, that the violet tinge is overlooked in the presence of the more conspicuous colours during an eclipse. The best results obtainable with the spectroheliograph, when K light is utilised, compare very favourably in sharpness of definition, as well as in the rendering of faint details, with the best photographs taken during an eclipse.

SHOOTING-STAR RADIANTS.—In connection with a table of radiant points observed at Hong Kong, Dr. Doberck refers to several interesting points relating to the phenomena of shooting-stars (*Ast. Nach.*, 3360). It is pointed out that the long continuance of some of the radiants is accounted for by parabolic motion, while others can possibly be explained by hyperbolic motion. In explanation of some of the radiants having somewhat similar elements, it is suggested that they were possibly associated with different tails of the same comet.

Owing to the fact that the meteorites are heated to incandescence nearer the earth in the evening than in the morning, there is a small decrease in the average magnitude of shooting-stars during the night; before 9 p.m. the average brightness is mag. 2·7, while of those seen later it is 3·2. Again, on account of the earth's movement, the duration decreases from 0·9 sec. between 6 and 8 p.m. to 0·5 sec. between 8 and 11 p.m., and to 0·3 sec. between 11 p.m. and 4 a.m. Up to 11 p.m. the mean length of path is 15°, and afterwards 13°. The average duration, length, angular velocity per second, and the numbers of shooting-stars observed, classified according to magnitude, are shown in the following table:—

Mag.	Duration. s.	Length. °	Velocity. °	Number.
1	0·9	19	21	60
2	0·4	14	35	79
3	0·3	13	43	130
4	0·3	12	40	128
5	0·2	12	60	97

The majority of the shooting-stars below third magnitude were probably hidden by haze and artificial light.

KEPLER AND HIS WORK.—In a little pamphlet entitled "Kepler's Lehre von der Gravitation" (Halle, Max Niemeyer), Dr. Ernst Goldbeck gives an interesting and appreciative account of Kepler and his work. The point principally elaborated is a main difference between Kepler's methods and those pursued by Ptolemy and the older astronomers. These latter were content to solve the problem of celestial mechanics on purely mathematical lines. They were instructed in the shape of the orbits and their dependence on time; they could foretell the place of an object at a definite epoch, and this satisfied their astronomical needs. Kepler, however, the forerunner of the modern school, is concerned in the character and the operation of the force, on which these motions depend. The points surveyed by the author as affecting the development of Kepler's views in his approach to a gravitational theory of the earth are: (1) The transference of the centre of the solar system from the earth to the sun, and the consequent disturbance of Aristotle's views. (2) The impetus given to mechanical inquiry by Gilbert's magnetical investigations. (3) The discovery of the coincidence of tidal phenomena with the position of the moon, and consequently the suggested attraction. (4) The telescopic examination of the moon by Galileo, and the confirmation of the suspected identity of its general character with that of the earth. Kepler's work on Mars, and his endeavours to trace the nature of the connection between the sun and the planets, are graphically described, and the whole pamphlet well repays careful study.

SCIENCE AND SOCIETY AT THE CENTRAL TECHNICAL COLLEGE.

THE object of the conversazione at the Central Technical College, Exhibition Road, on Friday, June 12, was to enable the scientific public to witness the ordinary working life of the students there. Consequently, while in deference to the lady visitors, the staircases and corridors were rendered attractive with arches of palms, arm-chairs, arc lights, and Hungarian airs, neither the blossoms, the banners, nor the band, were allowed to intrude on the apparatus and machinery, which were left as in every-day use.

Laboratory sinks remained sinks, and were not converted into make-believe flower-boxes; while no green baize covers hid the traces of oil and tools on the workshop benches, nor made them resemble extemporised billiard tables.

The Lord Chancellor, as Chairman of Council, and Lady Halsbury, received the visitors, and conspicuous amongst the 1700 were the Masters of many of the City Companies wearing their chains of office.

Exactly twelve years ago to-day (June 25, 1896) the Central Technical College was opened by the Prince of Wales, who expressed the opinion, "that the opportunities for advanced instruction, which will be afforded in the well-arranged laboratories and workshops, will enable the managers and superintendents of our manufacturing works to obtain more readily than hitherto the higher technical instruction which is so essential to the development of our trade and commerce." And, on the same occasion, the late Lord Selborne—the then Lord Chancellor—stated that "in the several laboratories with which this College is provided, new and increased facilities will be afforded for the prosecution of original research, having for its object the more thorough training of the students, and the elucidation of the theory of industrial processes."

An examination of the laboratories and workshops by the visitors at the conversazione, made it clear that the aims initially laid down for the working of the Central Technical College have been steadily kept in view. The Department of Mechanics and Mathematics showed the apparatus which had been developed for familiarising students with the laws of motion and force. Electric clocks transmit time-signals to quick-running Morse instruments for chronographically marking the instants of various experimental events. To measure "*g*" the falling body is started electrically, its moment of arrival noted electrically, and the interval measured with a vibrating tuning-fork; while for slower motions, such as that of a body rolling down an inclined plane, the electric current that liberates the ball starts a stream of water flowing from a water-clock, which again is instantly stopped on the ball touching an electric trigger placed at any desired point of its path. Apparatus for measuring centrifugal forces, studying impact, finding moments of inertia, timing the vibrations of pendulums, measuring the extensions of wire, &c., make us wish that, when, as boys thirty or forty years ago, we laboured through "little Newth," acquired a particle of Tait and Steele, and struggled with the rigidity of Routh's Dynamics, some Maxwellian demon had opened the door of Prof. Henrici's laboratory, and shown us so vivid a realisation of the principles of what, in the misleading jargon of that day, was called "statics and dynamics," with its "accelerating forces" and "moving forces."

In the same department were seen calculating machines and quadric surfaces, planimeters and plaster of Paris models, integraphs for solving differential equations, and integrators for evaluating areas; while the smooth working of the latest form of Prof. Henrici's harmonic analyser, by means of which ten coefficients in a Fourier's series can be determined by going only once over a curve, led the engineer to speculate on the time when all calculations, however complex, would be done by turning a handle, and when the brain would be left quite free to think and originate.

So much attention has of late been given by School Boards and County Councils to the establishment of manual training classes, that the collection of exercises in wood-working in the Carpenter's Shop of the Engineering Department, could not fail to attract attention. But more attractive still was the laboratory for testing materials, where the deliberate motion of the lever of the 100-ton machine, stretching steel plates until they broke, and automatically writing the history of the experiment with Prof. Unwin's stress-strain-recorder, was as fascinating to the lady-visitors as to the engineers who accompanied them. And how complete is the investigation that the students can make on the properties of the materials used by the engineer and builder, could be gathered from seeing the smaller machines which were bending thick beams of wood, stretching wires, and breaking blocks of cement, as well as from examining those specially designed for testing lubricants, gauges, and the elastic constants of materials, such as the screw and mirror extensometers and compressometers designed by Prof. Unwin.

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